

PLUMBISM

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LEAD POISONING

Being a Thesis for the
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B.A. , M.B. , C.M. , Ed.

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P L U M B I S M

or

L E A D P O I S O N I N G .

In this Thesis I intend to treat of Plumbism as we see it in men and women who work in lead factories. But I am well aware that the disease is contracted to a much less extent by persons who have to handle lead in its various forms. We thus see it among painters, plumbers, typefounders, compositors, mixers of metals, pottery workers, and accidentally among those who drink water sufficiently impregnated with lead, whether obtained from pipes or from any other source. A notable example of this latter was seen in a sea-engineer at Cape Town. He was accustomed to drink the ordinary water used for household purposes, the water being obtained partly from springs, gathering grounds, and rain collected from roofs. This water was conveyed in lead pipes and on that account was the cause of the contamination.

I have thought it advisable, before beginning the subject proper, to give a very short resume of the method employed in the manufacture of White Lead, as seen in the factories on the Tyne. When we enter such a factory the first process seen is the melting of the lead in the smelting furnaces. Here the Blue Lead women are employed ladling the molten lead into moulds. When the lead is cold it is carried by these women to the stackhouses. They are called Blue-lead women because after the molten lead has cooled in the moulds it assumes a bluish hue. Their risk is the least, although there is always a certain amount of poisonous dust in the air. In the stackhouses the lead is stacked in this way. The floor is covered with tan and on this tan are placed tree-pots containing acetic acid. The Bunches of blue lead are then laid over the pots and covered over with boards, making a second floor on which a layer of tan is spread. This process is repeated until the stackhouse is completely packed from floor to ceiling. The lead thus stacked is left for about thirteen weeks to be transformed by the action of the vapour arising from the acetic acid into sub-acetate of lead and next by the Carbonic Acid

gas rising from the tan into carbonate of lead, or white lead in its first stage.

After the lapse of thirteen weeks the white bed women are sent to open the stack or strip the white-bed. And it is then that the danger to health becomes very great, as there is much poisonous dust about, which penetrates through the respirators commonly called Muzzles. The white lead has now to be washed and ground. The grinding is done by the men. They wear respirators and although the lead is damp, and consequently less dangerous, the grinders still suffer badly from their employment. After the lead has been washed and ground it is collected into large tanks, where it is churned into a paste or dough of a certain consistency by women who are known as Roller Women. From these tanks the white lead is ladled into dishes, which hold twenty-four pounds of lead, by men and is carried by the women to the stoves or hot chambers in which the paste is dried. It is the drawing or emptying of the stoves that tells hardest upon the women. A few hours in the stoves every week, may if excessive care is not taken, very quickly develop symptoms of poisoning. The stove work is the most dangerous the

women have to do, and they are obliged to wear large smocks over their bodies and handkerchiefs over their heads; but the air being often dense and full of the dust they are with every precaution unable to prevent it from being breathed, swallowed or reaching the skin.

After the white lead has remained in the drying chamber for two or three weeks it is nearly ready for use. The stoves are now drawn by the women, who discharge the dishes into casks where it is pulverised by the packers, who beat the lumps with iron shovels; while this process is going on the air is full of the poisonous dust and this operation is perhaps the most dangerous of all.

We thus see from the foregoing the great dangers awaiting one who goes for the first time into such a place to work. However healthy he may be this poison sooner or later works its mischief, though, as experience teaches us, there is a great difference of results in the different workers. Some are only a few days employed when they begin to feel ill, others only after months or years. One thing is certain, they all become pale and sallow, which characteristic distinguishes them amongst their fellows. Sir Matthew White Ridley has recently

ordered that no woman shall be employed in white lead factories, and rightly so, as women are physically far more liable to lead poisoning than men; and the consequences of lead poisoning are far worse in their case. For one thing there are periods when it is impossible for her to take the daily bath, which is one of the indispensable precautions; again, women who are about to become mothers are by their condition exposed to the gravest dangers. For checking a too rapid growth of the population indeed, nothing better could be devised than the employment of women in white lead factories, for the lead-woman almost invariably miscarries, while of the children born there is a very great mortality during the first few months of life. Very many women, who menstruated regularly and had children naturally before going to the lead works, afterwards began to menstruate irregularly, miscarry or give birth to still-born babes. The real reason for the employment of women is a mere economic one, for if they are weaker and more liable to this disease than men, they can also be had for a much cheaper wage. The fact that women have mostly in the past been employed accounts for the great majority of cases among them; and another

factor is that a great many of these workers have had very bad surroundings and very poor food, and in many cases were the chief bread-winners for large families and lazy husbands. Poor women like these (and I may say they form the great majority of the workers) were not fit to do battle with this poison, but withal formed the most suitable soil for the poison's subsequent action.

As I have shown in the foregoing how lead may enter the body, so now I shall endeavour to unfold the various manifestations of it when once it has entered the system. Lead acts in two ways, viz., acute and chronic. The acute cases are happily few, generally ending in recovery; but now and then cases do arise which end in convulsions, coma and death. Death is probably due to an acute blood poisoning. I have thought it best to give what I should say in regard to acute cases in the form of two cases of poisoning, one by White Lead, the other by Red Lead. The first case is that of a young woman aged $17\frac{1}{2}$ years, but looking much older. (I may here mention that young women appear to suffer more than elder women from acute attacks.)

This young woman was in a semicomatose state when first seen and had an hour previously taken a

fit while at work. She had only been a lead worker for 22 weeks and had been working as a blue lead woman. This was her first attack and it really began a day or so before by vomiting her breakfast and whatever she ate or drank during the day. As I said, she was semicomatose, slightly cyanosed with pupils midway between contraction and dilatation, but still reacting to light. The patient was easily aroused. Her arms and legs were wildly thrown about without any regularity of movements, and shrieking loudly, keeping her teeth tightly clenched with intervals of relaxation. She refused to speak, but now and again opened her eyes widely and rolled herself from side to side. Her behaviour simulated very much Hysteria. Her face, lips, and conjunctivae were of a good colour, by no means anaemic. There was the faintest blue line on the gums and the mouth was moist and tongue slightly furred. The abdomen had no tenderness on pressure, and there was no wrist drop or paresis of any kind. The patient lay quite relaxed in the intervals between the outbursts. Efforts were made to arouse her and during these she sat up in bed, and sometimes even got out of bed, but immediately she again lapsed into her old state of semicoma. She had

four fits during the day, of no regular character. In the intervals between the fits she lay in the semicomatose condition generally on her left side with limbs flexed. The chest was not dull to percussion, but on auscultation contained Rales, both in front and behind on both sides. The circulatory system had no murmurs and the pulse was regular with good tension, but not well maintained.

The urine was passed into bed, but what we were able to obtain was acid containing urates and 7.43 grs. per $\frac{3}{4}$ i of urea, but no albumen. The fits continued at irregular intervals during the night, but of the same irregular character. The tongue was now bitten, but general condition remained the same. The following day four fits within half an hour took place, three of which like the former, but the fourth commenced with a few short respirations cyanosis with pupils dilated but no reaction to light. There was twitching of the muscles of right side of face, the right arm and leg became rigid, the rigidity giving place to clonic spasms. The left leg and arm became similarly affected. The breathing became more and more difficult and the patient died.

The second case is that of a man employed as

a grinder of red lead. The poisoning in this case was mainly due to the failure of the apparatus to prevent diffusion of the poisonous dust in the air. This man first suffered from a cough, then pains in head, stomach and joints followed. The appetite was still good for two or three days, then it suddenly was lost. Nausea and retching, even when stomach was empty, arose and the pains in the joints became more intense. There was also a continued gnawing in the stomach. On examination of the respiratory system there was found to be a slight cough with mucoid sputum and some red coloring matter, found to be red lead. The skin during the day was abnormally dry, but during the night this alternated with perspirations, but this was not excessive. The hair was quite red and remained so for a week afterwards. In moving the joints the pain was increased, and occasionally severe cramps occurred in the instep, calves of legs, and thighs. The joints were not swollen. There was less cramp in the arms, but generally occurred locally in the hypothenar muscles. There were also crampy pains in the submaxillary region of the neck. Taste was lost but due to peculiar metallic taste present, and the patient never had the use of the olfactory organs.

There was weakness of the extensors of left arm, but no wrist drop, also weakness of legs and shortness of breath on exertion. The knee jerks were normal. The bowels costive and the blood corpuscles numbered 3,000,000. The urine had a specific gravity of 1012 but was faintly alkaline with no albumen. The pains became much sharper in the knees, elbows and shoulder blades where it was attached to the humerus. The patient felt the left fore-arm weaker than the right and the grasp of the left much weaker. Forcible flexion of left hand and wrist was followed by severe pains up the extensor carpi radialis, the pronator and extensor minimi digiti muscles. Flexion of left thumb towards palm of hand gave rise to extreme pain along the course of the extensor ossis meta carpi pollicis and when the right hand was dipped into cold water there was created a sense of tingling in the fingers and back of wrist. On the left side none of these symptoms were at all marked. Tenderness was present in muscles of forearm and was most marked on grasping them. There was no anaesthesia of left arm but only partial anaesthesia of the extensors in places on the right fore arm.

The heart first sounds in the mitral area became slightly reduplicated and the spleen was distinctly

enlarged. The pain gradually disappeared, but with one relapse of very severe cramps which seemed to be localised in the diaphragm. The patient soon became quite well.

I now come to that class, the chronic, which mainly contains the great majority of cases of lead poisoning. Chronic plumbism always has one symptom in common and that is anaemia or chlorosis, we find that pale sallow face everywhere and I was inclined to place it as a distinctive type. In acute cases we sometimes get anaemia present but only in those cases where the patient has worked for some time in the factory and they are rare. The majority of the acute cases as I have said before occur in those young persons who have only started to work among lead, and so are often far from anaemia.

Many men and women have nothing else than the palor, whether it be due to their extreme carefulness, their strong personal resistance, or to their often temporary holiday. I have known several persons who have worked for months and even years, and all the troubles they have had were due to their anaemia.

I have divided the chronic cases into ten types, all of which have been represented in the fifty-two cases of lead poisoning attended to by myself. Why I have divided them may be seen in the following description.

Types:

- 1st. Where the abdominal symptoms are the only ones.
- 2nd. Where we have only an affection of the wrist (partial or complete).
- 3rd. Where the abdominal is gradually passing into the wrist type, and which may be called the Transitional.
- 4th. Where the abdominal and Wrist types are completely combined.
- 5th. The Ataxic.
- 6th. The Tremor.
- 7th. The Epileptiform.
- 8th. The Neuritic.
- 9th. Saturnine Encephalopathic.
- 10th. The Ocular.

1st. The type where the abdominal symptoms are the only ones. Here we have a patient suffering off and on from anaemia with a whitish tongue, great thirst, dull heavy pains across the bowels with great vomiting and constipation. There is a blue line generally upon the gums. No wrist drop present. The cardiac and pulmonary systems quite normal, with the exception of the blood being deficient in red corpuscles which in one case numbered 3,470,000 per c.c. The urine is generally acid

and without albumen. The specific gravity of the representative case was 1012.

With the ordinary treatment the patient is generally soon well again.

2nd. Wrist Type. The patient is often a pale and sallow woman with faint blue line round the bases of incisor and canine teeth in upper and lower jaws. The tongue is often large and flabby, with whitish fur and sometimes complains of a sweetish taste in the mouth. There is no lead colic, but often complains of her gradual emaciation.

The fore arm becomes atrophied, the right being sometimes more than the left. There is no tenderness and no loss of sensation and no irritability of the muscles. In the right hand the wrist drop is generally well marked, as is also the dropping at the metacarpophalangeal joints, especially of the three inner fingers. The patient can flex the hand, but cannot extend it, and the same applies to the fingers. There is a loss of power of adduction and abduction, thumb too has lost its power of abduction but retains that of adduction and opposition. On extending the first phalanges on the meta carpals and bending the terminal ones, the patient is able to extend the latter showing that the interossei and lumbricales are not affected. The left hand is

similar but less marked. Often there is pain in the right wrist but no swelling to be seen. Also find no pain on firm pressure either on hand or fore-arm or in neck. The eyesight is generally good but sometimes is greatly impaired.

The urine has generally a specific gravity about 1010 and acid in reaction, but as a rule without albumen.

3rd. Transitional Type. We have here a patient who is anaemic and suffering with great pain in the abdomen, sometimes extending around the back. There is a well-marked blue line on the gums and the lips are sometimes sore. The tongue is furred and appetite poor. Nausea and vomiting often are present, and the abdomen is generally tympanitic over the right iliac region. The bowels are costive and the patient sometimes passes very little water and it is generally loaded with urates with an acid reaction and **no albumen.** There is great weakness generally in both hands but sometimes more marked in left hand. The patient can only grasp the hand feebly, the extensors of the hand being only partially paralysed and somewhat wasted, and so there is very indistinct wrist drop.

4th type is the complete abdominal and wrist types. The patient has severe pain in abdomen, nausea, and vomiting and a continued sense of sickness, especially after food. There is great constipation, a blue line on the gums and generally headache. The vomit is sometimes dark green.

The arms generally get weak with sometimes shooting pains in them and the legs, and the patient with great difficulty moves the lead. The patient generally has been off and on for months or even years. She sometimes has severe pains in the region of the shoulders, and often the pain shoots down the upper forearm. The wrist drops (and it is often double) and she can only raise the right arm by scapular muscles. The severe pains now sometimes disappear, but very often she complains of the arm muscles being tender. There is no anaesthesia of the skin.

The movements of the hands and fingers are like those described in the wrist type. It is, however, interesting to observe that the supinator longus on each side can sometimes be thrown into a state of feeble contraction not sufficient to perform the action of supination. There may be, but generally there is no paralysis of the legs and the

patient is not so emaciated in proportion to that in the arms. The knee jerks are generally absent on both sides.

5th Type. The Ataxic. The patient is anaemic with sallow complexion and looks debilitated and weak. Both the pupils are slightly contracted and the eyes share in the general condition of the anaemia but the patient often states that she has had no trouble with her eye-sight and that she has had no headaches.

The alimentary system is often slightly affected. The lips are pale and teeth bad with a blue line in the gums. There is pain on swallowing and often the pain is referred to the upper part, front and sides of the abdomen and this troubles him constantly. Constipation is generally always present.

There is almost universal atrophy of the muscles in the scapular region, and the patient is unable to raise his arms. The left arm is less affected, but the pectoral muscles and biceps are flabby with the fibrillar thrill and myoedema well marked. The forearm has completely lost its power of extension, so that we have marked wrist drop. Very feeble are the movements in the fingers, and the arm is semi-flexed at the elbow. The legs share in the general wasting, and there is complete loss of knee-jerk, and

the patient walks with difficulty, but there is no ankle clonus or ankle drop. The pain in the abdomen is eased by pressure, and the abdomen is slightly contracted. He can move the right thumb and extend it quite well, but cannot extend the fingers or wrist although she can pronate and supinate quite well. Can flex the arm and forearm, and extend to the point already mentioned. There is a deepening of the interosseous grooves, but no pain along the interosseous nerve. There is no loss of sensation, also there is not so much paralysis of the extensors of the right side, but there is almost complete paralysis of the fingers, and the adductor muscles of the thumb. On walking her gait is ataxic, There is a little dragging of the left foot, with a tendency now and again for the foot to be placed in front of the other. She walks on the front of her foot, and occasionally on the heel. She feels the floor quite distinctly and knows that she is walking upon the carpet. On closing her eyes the staggering increases, but the case never shows the proper ataxic gait.

6th. The Tremor Type. Here the patient complains of muscular tremors with a slight weakness

in the arms and legs, and a slight dimness of vision. The head especially shakes very much during exertion. The patient is pale, anaemic and thin, but in one case there was no blue line perceptible. As the patient lies in bed there is no observable muscular tremors, with the exception of the right hand, which vibrates slightly but continually.

7th. Epileptic type. In the case representative of this type the patient felt sick and giddy, she had been feeling ill during the week previous, but now this increased very much for ten minutes, and then she felt herself about to fall. She immediately became insensible. There was no cry and no twitching of the muscles of the face. The hands and arms were thrown about and the face became quite black. The patient was a well nourished woman, but rather pale. Her bowels were regular and there was a faint blue line, but no colic. There was accentuation of the cardiac sound in the pulmonary area, but otherwise the heart was normal. There were pains in left arm, travelling down into hands, and also the same in the left leg, especially when she walks. There was also anaesthesia over the left leg dorsum and sole of left foot. Knee jerks were present, but not well marked.

8th. The Neuritic type. The patient is generally not well nourished and is very pale, sometimes she suffers from headache. There is the blue line on the gums and the abdominal symptoms, nausea, vomiting, if present, are generally of a mild character. The patient often finds her abdomen extremely sensitive to superficial and deep pressure. The upper part of the neck is often held firm and on pressure along the lines of the vagi in the neck there is extreme tenderness. Pain also is felt in each arm on pressing above the elbow along the musculospiral nerve and down the back of the forearm along the posterior interosseous nerves where pressure is badly borne. There is, generally speaking, increased sensibility to pain over the back of the hand and more particularly so when a pin is applied to the back of the forearm. There is often a feeling of pins and needles felt in the ends of the fingers, but generally not much pain, nor in the front of the forearm until the upper third is reached. There is considerable weakness in grasp of each hand, almost amounting to undeveloped wrist drop. The pain, however, is most keenly felt when the extensors are put into action. The prick of a pin is appreciated over the front of the biceps, but

when it is applied to the posterior part along the line of the musculospiral nerve it is extremely hard to bear, and this is the same on both sides. It is not painful when you grasp the biceps, but extremely so when you do the same to the triceps. The above remarks apply to the leg, the pain being acutely felt over the skin of calf of the legs.

9th. Saturnine Encephalopathic. I have two cases illustrative of this type. The symptoms are mainly cerebral, such as headache, delirium, hallucinations, insomnia, melancholia and general debility. Sometimes convulsions and coma, in which case patient usually dies. Hemiplegia and hemianaesthesia have been noted by others, but in none of the cases examined by me were such symptoms present. I found deficient eyesight in some cases, due to optic neuritis, but generally the only symptoms associated are nausea, and retching, sometimes vomiting and constipation and slight pain in the abdomen. The abdomen is only tender where the pain is, but there is no marked distension. The tongue is often furred, sometimes being brown in the middle and white at the edges. The mouth is occasionally so dry that the patient can hardly speak. The breath may be fetid, and often a

bad taste, sometimes of a sweetish nature. The patient is anaemic, and sometimes there is well marked white patches under each eye. There is no excessive paralysis. The urine in one case was scanty, high coloured, with albumen and granular casts. This is the only case in which I found kidney disease. In the cardiac region I found also in one of the cases a systolic mitral with reduplication of second sound in aortic area.

10th and last type is the Ocular. I cannot do better than give two well marked cases. The first was a very anaemic woman with headache, pains in the abdomen, and right wrist drop, but no vomiting or constipation. The pains soon disappeared, but suddenly her sight left her, so that she could only see a kind of shade when anything was placed in front of her face. Vision then gradually disappeared, until she became totally blind. On examination the pupils were found to be widely dilated, and the discs extremely white and rapidly passing into a state of atrophy.

The second patient complained of great bodily weakness. She was very anaemic and had constant pain in the head, arms and right leg. There was abdominal colic and great constipation, but only a

slight tendency to wrist drop, especially on right side. The pupils were widely dilated, and vision was very much impaired. There was well marked neuro-retinitis. The borders of the discs were irregular and numerous white patches could be seen around the vessels in the disc and retina, the course of the blood-vessels being obscured by the exudation. The left disc became quickly atrophied and is now extremely pale.

MORBID ANATOMY AND PATHOLOGY.

In the acute cases the body is often well nourished with the cheeks and lips well colored. There is generally a very faint blue line upon the gums, upon the upper outer left incisors and canine teeth in both jaws. The mucous membrane of the stomach and intestines is often inflamed and in some cases covered with white or whitish yellow mucous, more or less impregnated with lead, but generally no corrosion. In one case the liver was found to be three lbs. in weight, the tissue somewhat pale and lobulation feebly marked and the surface quite smooth. The kidneys' capsule could be easily stripped off and the veins on the surface were slightly engorged. They both weighed four oz. The cortex was normal, but the pyramids were perhaps slightly darker than usual. The spleen was soft and weighed 5 oz. The brain, when removed, allowed some fluid to escape from spinal canal. The convolutions were flattened and the vessels of the pia mater were engorged, but the vessels at the base were healthy. The brain cuts firm and is relatively dry. The vascular puncta of the white matter, generally the grey matter of the basal ganglia and cortex

appears to be of the natural hue. Pons medulla and cerebellum were healthy, and the spinal cord also was found to be the same. The heart: the left ventricular walls were relatively thick, perhaps slightly hypertrophied, while the right walls were firmer. The vascular substance was friable and normal in colour. The valves were healthy, as was also the endocardium. Both ventricles contained loose black clots. The uterus and ovaries were healthy, and the ovaries showed evidence of recent menstruation.

No lead could be found in any organs except the stomach and bowels.

In the chronic cases there are no constant post-mortem appearances. The muscles of the paralysed parts are generally flaccid and atrophied and so lose their bulk. The muscular fibres diminish in size, the transverse striation becomes less distinct, and the substance becomes granular. Later the transverse striation is lost or is replaced by longitudinal striation and there is increase of the connective tissue between the fibres. The spleen is often enlarged and in one case I found the thyroid also. Also found the kidney once granular and in two cases the lungs emphysematous. There were no signs of gout in any of the cases.

The lead seems mostly to act upon the blood and so cause anaemia, for in every case of chronic lead poisoning, the blood is greatly deteriorated, and even in one case the person was so debilitated by this action of lead upon the blood and nerves that bed sores developed.

The neuritis is at the bottom of the paralysis and paresis, but it is generally peripheral and not often central. Lead has been found in various organs of the body, but in exceedingly small quantities.

DIAGNOSIS.

This is generally easy, but we have found in several cases a great resemblance to epilepsy, locomotor ataxia, paralysis agitans, progressive muscular atrophy, toxaemia by strychnine and other drugs, and rheumatism. We should enquire into the history of the case and if we get a history of lead poisoning with the presence of a blue line on the gums and the presence of lead in urine and vomit, we can safely diagnose as a rule. Many times the diagnosis can be made certain by giving the patient potassium iodide and then testing the urine for lead.

If we go carefully into these cases of doubt,

we will be sure in the most of them to get some history of the most common symptoms of sickness, vomiting, blue line, and if not fully developed wrist drop you will get the partial.

Plumbic paralysis is generally quite distinctive and so different from any other paralysis; yet in some cases the diagnosis may be impossible.

PROGNOSIS:

Death often takes place, but generally the patient recovers. In some the paralysis entirely passes off, in others only partially, while in others again, the muscles are for ever destroyed and so leading to great deformities and consequent helplessness. Ill-health sometimes intervenes, bringing diseases which sooner or later will carry off the patient. The fact is that in spite of all precautions the trade is a deadly one, and that if white lead is to be produced at all, it can only be effected at the cost of human health and life. Yet we must not take too gloomy a forecast, for things can be greatly improved by both employer and employee acting with strict attention to rules and regulations and perhaps by great improvements in the method of manufacture. The real danger is from the dust, and so

if means were devised to prevent its circulation in the air, I think a great deal would be done towards making the lead factories more safe and healthy to those employed in that industry. I can easily understand how the death rate is higher man for man among lead workers than any other industry, but here again statistics are very much vitiated by the fact that not half of the deaths directly caused by the poison are entered, as the men are dismissed from the yards before they are actually moribund. Many a patient will tell you that all their illnesses date from entering the lead factory. This may be many years after leaving the trade. I can well remember one whom I saw two years ago. It was twenty years since he left the lead works, but when he did leave, it was to have a future of helplessness. Imagine a person devoting himself to such a life where he has to put up with intermittent periods of the most painful nature. Two months on and one month off. I may generally say the worker is ill three months out of the twelve. It can therefore be seen how dangerous a trade it is, and for the workers how gloomy may be the prognosis. Yet, as I have said before, I have seen men who have worked for years in lead works and suffered practically in no

way. No doubt it was due to their extreme carefulness and to the plan of holidays every now and then, even when feeling in the best of health. I have in view at present a friend of mine who has been a manager for very many years, and I cannot say that I have ever seen him idle from lead sickness. But I must say that this class is a great exception.

TREATMENT:

The treatment of lead poisoning must be met in two ways: first, we must try to remove the poison which has not been absorbed so as to prevent any further evil and, secondly, we must remove if possible, the lead which is circulating in the system.

Nature often steps in and removes the poison in the stomach by vomiting, but has no effect upon the poison in the blood. But nature, though active in that way, is inactive in another by allowing the bowels to become constipated. Our first duty then is to see to the bowels, and after a time to allay the vomiting, if present, for it generally causes great strain and pain to the patient, and sometimes is very helpful in producing collapse. In most cases we have to give an enema as any aperient given by the mouth is generally immediately vomited. We cannot

do much harm in trying aperients by the mouth at first for if they are vomited they may be the means of doing good whither it be sufficient being left to act or by the mere washing out of the stomach. Castor oil alone or combined with laudanum seems to be a favourite and very useful remedy. We may try calomel followed by a saline, or any of the common aperients at our command. I think it is a very good plan to first give an enema and follow it up with an aperient. It might be very advisable to give dilute sulphuric acid (and a good way is to give it with Magnesium Sulphate), at the very first, for the purpose of acting upon the lead in the stomach and bowels, and so converting it into a non-poisonous form.

We must also at the outset attend to the stomach and our treatment should be first to remove its contents and, secondly, to allay or soothe its irritable mucous membrane. The stomach naturally tends to eject any irritant which may be in its cavity. Even after the main contents of the stomach had been vomited there still remains a sticky material full of bile and lead. This the stomach itself has a difficulty in removing. We can easily come to its help by getting the patient to swallow several tumblerfuls of warm water. He will vomit this, but we must persist on his repeating the process several times. By this means

we will be able to give the stomach a very good wash, and at the same time perhaps be able to remove all foreign material. You will find the vomiting often to cease or at least to become very much abated.

In those cases where we have no vomiting to help us in emptying the stomach we must have recourse to artificial means such as tickling the throat with the finger or by a feather. In this way we may be able to start the vomiting and so empty the stomach. Emetics might be employed but they are hardly needed when such simple instruments are at hand. Some advise lavage by stomach tube, but extremely few people will allow you to use that instrument, however useful it might be. I think it would be our duty if the other methods failed to urge as strongly as possible lavage by stomach tube. I believe in time the people will look upon the method with less fear and consternation. They look upon sword swallowing as nothing but to swallow a simple tube seems something out of the way.

After the irritants have been removed one of the best sedatives to the irritable stomach is Bismuth. It seems to allay all irritation and so prepare for the proper taking of food. We may have it vomited up two or three times but as a rule this irritation

soon ceases. If there is any pain we may add some laudanum to mixture, but we must be careful not to produce constipation and if there should be any tendency to it, it would be best to add some carbonate of Magnesia. If the vomiting should persist a great deal of good is often obtained by adding to the Bismuth mixture, some dilute Hydrocyanic acid, and may apply counter irritation to the region of the stomach. This may be done by a mustard poultice or emplastrum, and by these methods is obtained often a cessation of pain. The best food is simply milk with or without soda given every two or three hours but if it be rejected by the stomach or in those cases where nothing lies in the stomach it is well to let the patient take nothing but ice and acid water in very small quantities until the mucous membrane of the stomach is able to bear it. The strength may still be kept up by rectal injections should there be any difficulty in taking food by the mouth for some time. We must be careful to guard against collapse and if it should arise be prepared to treat it. We must therefore keep the patient warm in bed and so must be wrapped in hot blankets with hot water bottles placed at his feet and diffusable stimulants given or by injections hypodermic-

ally given of Ether Caffein etc., in salt or sugar solution into veins in severe cases.

So far we have endeavoured to prevent lead from being absorbed. Now we must try to eliminate that which has been absorbed. The best plan is to administer potassium iodide for two or three weeks, and from time to time to test the urine for lead. In this we have a means of diagnosis and an indicator of lead.

In treating the paralysed muscles we must have recourse to the Galvanic continuous current as the Faradic has no action either in muscle or nerve. With the Galvanic current there is increased contraction of the muscles, and greater contraction is obtained with the Anode on the muscle than with the Kathode. Massage, if properly applied, is very helpful, especially if continued with the Battery appliances. But we must be on our guard against massage in those cases where the patient has to be fed rectally for they bear massage very badly.

We must now administer good nourishment, but of course it must be easily digested as the stomach may be weak as a consequence of its severe trials. Fish, fowl, mutton may be allowed after we have cautiously found the stomach to digest fairly well and so gradually we may after a time be able to return to the pat-

ient's standard diet. At the same time we must look to his anaemia and the best way is to administer iron in its most suitable form. I find the Ferri et Ammon Cit. combined with Arsenic and Nuxvomica a very suitable mixture. Nuxvomica and Strychnine may be added on account of its value as a muscle tonic.

The patient should have plenty of fresh air whether when confined to bed or when able to walk in the open air. Gentle exercise at first, but may later be continued further but not sufficient as to cause exhaustion of the muscles as it would then be injurious.

When our patient is quite well and is eager to return to his work or in the case of the young patient who starts for the first time as a lead worker what can we advise them to do in the shape of prophylaxis. It is often said that if there are so many victims of this trade, it is because the workers neglect the precautions that are insisted upon by the masters, and it must be admitted that certain masters of factories show interest in the well being of their employees. Many firms even supply breakfasts to them thinking it absolutely necessary for the stomach to be full before beginning work in the morning. Drinks acidulated with sulphuric acid are prepared for the

workers, but many do not like it and so evade it as much as possible. They do not seem to look upon it as a help but rather as a nuisance. They prefer the beer which by an old custom of the trade is supplied by the masters to the workers as part of their wages, and the taste is thus developed for drinking habits, partly perhaps due to the ease, their aches and pains get from the alcoholic liquors.

The lavatories and baths are usually in excellent condition and should especially be used after finishing their work, and at any other time it should be deemed necessary. But if the workers shirk the daily bath on leaving work the fault would seem to be with the masters who are generally well able to enforce this rule. Some are so careless that they would think nothing of eating their food at the works or at their homes without even washing their hands. This eating of their food is a very common means of introducing the poison into the stomach. The workers are all supposed to wear respirators but here again is the same carelessness. You will often hear the foreman shouting to some one to put on their respirator but when his back is turned it is taken off again. They seem to think of no danger or are very callous over it,

till the time when the doctor begins to examine them, and then they begin to see the great risk of losing their positions. The doctor examines them every week and here you may see the curious spectacle of inverse malingering. Men and women really ill-pretending to be well using every artifice to persuade the medical man that they are in no way affected. And if they happened to be refused work in the strength of the doctor they are accustomed to offer themselves under an assumed name at some other works. The adoption of an alias is a common practice among them. To obviate that the masters issue a list of the names of the workers who have been suspended by the doctor's orders and circulate them among the trade. This is a trade in which every care should be taken whether it be in the direction of baths, brushing of clothes, cleaning of nails, eating and drinking after work, or especially in the conduction of each and every duty with the strictest regard for rules and regulations. Even then we would have many cases of Plumbism but indeed far fewer than we have at present. The only true prophylaxis is to leave the works and adopt an entirely new vocation.